

Segmental Portal Hypertension

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Isolated obstruction of the splenic vein leads to segmental portal hypertension, which is a rare form of extrahepatic portal hypertension, but it is important to diagnose, since it can be cured by splenectomy. In a review of the English literature, 209 patients with isolated splenic vein obstruction were found. Pancreatitis caused 65% of the cases and pancreatic neoplasms 18%, whereas the rest was caused by various other diseases. Seventy-two per cent of the patients bled from gastroesophageal varices, and most often the bleeding came from isolated gastric varices. The spleen was enlarged in 71% of the patients. A correct diagnosis in connection with the first episode of bleeding was made in only 49%; 22% were operated on because of gastrointestinal bleeding, but the cause of bleeding was not found. The diagnosis should be suspected in patients with gastroesophageal varices, but without signs of a liver disease, especially if isolated gastric varices are found. The diagnosis is confirmed by portography.

PATIENTS WITH EXTRAHEPATIC portal hypertension constitute 5–10% of all patients with portal hypertension (PH).^{1–3} Isolated obstruction of the splenic vein leads to elevated pressure in the spleen and is a form of extrahepatic PH. The condition is present in only about 5% of patients with extrahepatic PH,^{4,5} but it is important to diagnose it, since it is the only form of PH that is definitely curable.⁶

Sutton et al.⁷ were able to find 54 cases in their review of the English literature between 1900 and 1968, and the condition is still so rarely diagnosed that only a few can gain experience with many patients. To outline recent years' experience with splenic vein obstruction, we have in the light of a topical case⁸ reviewed the literature of this form of extrahepatic PH, referred to as segmental,⁹ left-sided,¹⁰ regional,⁷ localized,¹¹ compartmental,¹² lienal,¹³ or splenoportal hypertension.¹⁴

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Materials and Methods

We have reviewed the English literature after Sutton et al.,⁷ i.e., from 1969 to 1984. Defining isolated splenic vein obstruction as total or partial occlusion of the lumen of the splenic vein leading to formation of collaterals and with a normal portal and superior mesenteric vein, we found 73 references on this subject. Ten of the references were review articles and articles on diagnostics, in which the individual patients were not identified.^{6,7,15–22} The remaining 63 references described a total of 209 patients with isolated splenic vein obstruction.^{10–14,23–80} These patients are grouped according to sex, age, fundamental disease, symptoms, characteristic findings, diagnostics, treatment, and prognosis.

Results

Sex and Age

In the case of 131 patients, both sex and age were stated. There were 89 men (68%) with a median age of 48 years (ranging from 10 months to 85 years). The women had a median age of 45 years (ranging from 2 to 75 years).

Etiology

The cause of splenic vein obstruction was described in 187 patients (Table 1). In 65% of the cases, the cause was pancreatitis, and 33% of these patients had a pancreatic pseudocyst. Benign or malignant pancreatic tumors were the cause of splenic vein obstruction in 18% of the patients, whereas 17% of the cases were caused by a number of different diseases. In nine cases, isolated splenic vein obstruction was accompanied by cirrhosis of the liver, and, thus, a simultaneous presence of generalized and seg-

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mental PH was seen in these patients. In addition to cirrhosis of the liver, four patients also had chronic pancreatitis, which was probably the original cause of the splenic vein obstruction. Two patients had splenic vein obstruction after the performance of portosystemic shunt. Only in three patients could no cause of splenic vein obstruction other than cirrhosis of the liver be found.

Symptoms

The patients' symptoms appear in Table 2. The most common symptom, which was present in 115 patients (72%), was bleeding from gastroesophageal varices. Usually, the bleeding was serious, in the form of hematemesis or melena. Often, there had been symptoms of a fundamental disease prior to or coinciding with the episode of bleeding. In 25 patients (16%), however, the bleeding was not preceded or followed by other symptoms, even though a cause of splenic vein obstruction could be demonstrated in 21 of these patients.

Abdominal pain without bleeding was present in 23%, often accompanied by other symptoms of chronic pancreatitis, a pancreatic pseudocyst or pancreatic cancer. One patient presented with encephalopathy without gastrointestinal bleeding.⁴³ The cerebral symptoms disappeared after splenectomy and the closure of a large collateral vessel from the splenic and superior mesenteric veins to the renal vein. Several liver biopsies, however, showed chronic persistent hepatitis, and, thus, this disease may have contributed considerably to the encephalopathy. Encephalopathy because of splenic vein obstruction was not demonstrated in any other patient.

Findings

A characteristic finding in the case of segmental PH is isolated gastric varices. The conditions in the esophagus and the stomach were described by means of angiography, upper endoscopy, and/or perioperative findings in 191 patients, 144 of whom (75%) had isolated gastric varices, whereas only 46 patients had varices in both the esophagus and the stomach. One patient had no gastroesophageal varices but did have varices in the left flexure of the colon.⁴⁴

Splenomegaly was present in 110 (71%) of the 154 patients whose spleens were described according to size. The basis on which to estimate the size of the spleen, however, varied a lot from one article to another. Itzhak and Glickman¹⁴ went thoroughly into this subject of the size of the spleen in connection with isolated splenic vein obstruction. On the basis of arteriographical findings, they found that the spleen was enlarged in eight (42%) of 19 patients. Only in a few patients did the enlarged spleen

TABLE 1. *The Cause of Isolated Splenic Vein Obstruction in 209 Patients*

Diagnosis	N
Pancreatitis, total	122
Chronic pancreatitis without pseudocyst	56
Acute pancreatitis without pseudocyst	5
Pancreatic pseudocyst	40
Pancreatitis, unspecified as to acute and chronic inflammation and pseudocyst	21
Pancreatic neoplasms, total	34
Adenocarcinoma	23
Cystadenoma	5
Islet cell tumor	6
Idiopathic	6
Cirrhosis of the liver	3
Consequences of umbilical vein catheter	3
Retroperitoneal lymphoma	3
Retroperitoneal fibrosis	2
Adenocarcinoma in the kidney	2
Consequences of surgical portosystemic shunt	2
Consequences of resection of the stomach	2
Various causes*	8
Cause not stated	22
Total	209

* One of each of the following: congenital pancreatic cyst, retroperitoneal abscess, wandering spleen, gastric ulcer, abdominal trauma, hydatid cyst in the spleen, cavernous splenic vein, sarcoma in the colon.

produce symptoms because of size or leukocytopenia and thrombocytopenia.

Diagnostics

Often a long period of time had passed from the appearance of the first symptoms till the diagnosis was made. Thus, the period of time, from the first episode of bleeding till the diagnosis was made, was stated in 82 patients. Only 49% had their diagnosis made in connection with the first episode of bleeding, whereas 1 month to 12 years (median: 11 months) passed before the correct cause of the bleeding was found in the remaining patients. Twenty-

TABLE 2. *Symptoms in 209 Patients with Isolated Splenic Vein Obstruction*

Symptom	N
Visible bleeding, total	99
Visible bleeding and other, previous symptoms	74
Visible bleeding without other symptoms	25
Occult bleeding and other, previous symptoms	16
Abdominal pain without bleeding, possibly accompanied by other symptoms	36
Other symptoms*	9
Symptoms not stated	49
Total	209

* Three splenomegaly, 2 icterus, 1 encephalopathy, 1 thrombocytopenia, 1 splenic rupture, 1 diabetes mellitus.

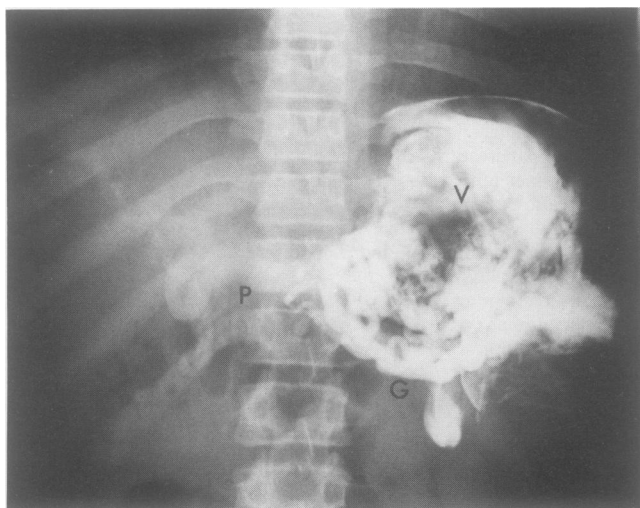


FIG. 1. Splenoportography in a 15-year-old boy with idiopathic isolated splenic vein obstruction and bleeding from gastric varices (V). The normal portal vein (P) is filled by the gastric varices and by the prominent gastroepiploic veins (G). There are no esophageal varices.

six (22%) of the 116 patients who bled from the gastrointestinal tract were operated on for the bleeding, but the cause of the bleeding was not demonstrated at the operation. The correct diagnosis was not made until new episodes of bleeding and new examinations had taken place.

Treatment

Most patients were treated by splenectomy. The course following splenectomy was stated in the case of 72 patients

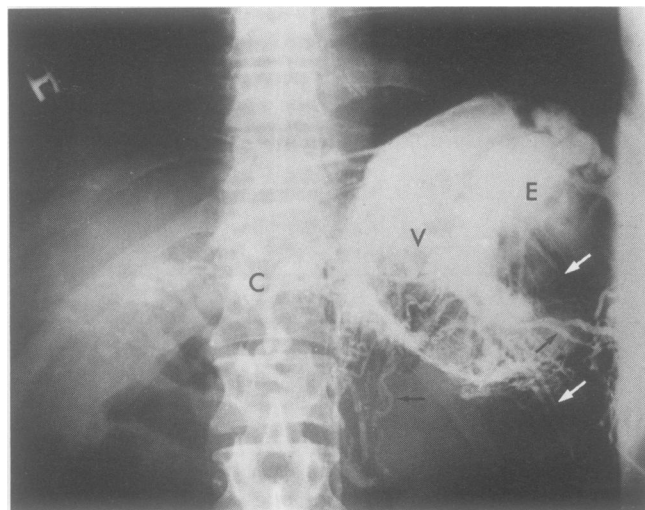


FIG. 2. Splenoportography in a 54-year-old man with inoperable pancreatic cancer. There are prominent splenosystemic collaterals to the retroperitoneum (black arrows) and intercostal veins (white arrows). There is some extravasation of the contrast (E). There had been no gastrointestinal bleeding, and the varices (V) in the fundus and the coronary vein (C) are small. There are no esophageal varices.

with a median period of observation of 12 months (ranging from 0 months to 24 years). Only two of these patients had bleeding following splenectomy.^{70,73} One bled because of cirrhosis of the liver with generalized PH and coagulation disorders. The other patient did not stop bleeding until total gastrectomy had been performed. Liver biopsy showed stasis, but no cirrhosis, and the cause of the re-bleeding was not clear.

Thirteen patients had bleeding, but splenectomy was not performed. Four of these patients died shortly after the diagnosis was made because of persistent or recurrent bleeding and because of the fundamental disease. One of these patients was treated by mesocaval shunt, which did not affect the bleeding.⁵³ None of the remaining nine patients bled again, but five died shortly after from the fundamental disease, and the other four were observed for only 6–12 months.

Splenectomy was not performed in only six patients without bleeding at the time of the diagnosis.^{12,25,50,57} One of these patients bled 3 months later and was treated with percutaneous splenic embolization.²⁵ None of the others bled, but the period of observation was only 8–18 months.

Discussion

Pathology

Obstruction of the splenic vein causes the pressure in the spleen to rise, and a number of splenoportal collateral systems will develop (Fig. 1), returning the blood from the spleen, bypassing the splenic vein, into the portal vein.^{14,22,65} There is retrograde flow through the short gastric veins into submucous and subsequently varicose veins in the fundus and the cardia area, from where the blood flows hepatopetally through the coronary vein to the portal vein. Retrograde flow through the left gastroepiploic vein into the right gastroepiploic vein and the superior mesenteric vein also occurs. Often the gastroepiploic veins are connected with dilated veins in the omentum. The left gastroepiploic vein may also lead the blood into the left colic vein and the inferior mesenteric vein.

Splenosystemic collaterals may also be formed, such as retrograde flow through the short gastric veins into the submucous and subsequently varicose veins of the esophagus. Collaterals from the spleen to the retroperitoneum, renal vein, and intercostal veins are not so common (Fig. 2).

Cause

Splenic vein obstruction may be caused by compression of the vein by other organs or by thrombosis of the vein.⁵⁰ Often a combination of these two factors will be present.

In their review of the literature, Sutton et al.⁷ found that 35% of the cases of isolated splenic vein obstruction

were caused by tumors and 17% by pancreatitis. We found that tumors caused 21% and pancreatitis 65% of the cases of splenic vein obstruction. These differences may be due to an increase in the number of cases of pancreatitis and to an increase in diagnostic and especially angiographic activities during recent years.

The distribution on sex and age found in our review agrees with pancreatic diseases as the predominant cause of splenic vein obstruction.

Frequency

Segmental PH has been found in 4–6% of patients with extrahepatic PH.^{4,5}

In patients with chronic pancreatitis, segmental PH has been found in 5–37%, based on angiographic and perioperative findings.^{9,81–83} The clinically and histologically most severe cases of chronic pancreatitis lead to the most severe changes in the splenic vein.^{9,81} This is most likely the explanation of the different statements of the frequency of segmental PH, as the indications for performing portography and operation vary in the various materials. Complications of pancreatitis in the form of a pseudocyst seem to increase the frequency of splenic vein obstruction; Rösch found that 14 of 16 patients (88%) with pancreatic pseudocyst had splenic vein obstruction.⁸¹

Symptoms and Findings

The symptoms and findings consist partly of those that can be traced back to the fundamental disease, such as pain, weight loss, or an abdominal mass, and partly of those caused by the segmental PH: gastrointestinal varices, probably with bleeding, and splenomegaly, which may be a hampering mass or which may give leukocyto- or thrombocytopenia.

Like others,^{12,23,38} we found in our review of the literature that hematemesis and melena caused by bleeding from isolated gastric varices were the most important signs of isolated splenic vein obstruction. Segmental PH does not always produce symptoms, but the indications of the frequency of symptoms vary a lot in the literature. Thus, bleeding has been found in 12–69% of patients with segmental PH caused by pancreatitis.^{37,82,84}

Diagnostics

A decisive point when diagnosing segmental PH is the demonstration of gastroesophageal varices in a patient who shows no signs of a liver disease. Especially in the case of isolated varices in the stomach, isolated splenic vein obstruction should be suspected. It may be difficult by endoscopy to distinguish the varices from normal mucosal folds, and the varices are only demonstrated by means of endoscopy in 0–33% of the patients.^{14,37,38} In

the case of barium examination of the stomach with double contrast technique, the varices are visualized in about 80% of the patients.^{38,45}

The diagnosis can be confirmed by portography. Recent works recommend the performance of arteriportography or indirect portography.^{18,76} The characteristic finding on injection of contrast in the celiac artery is that in the venous phase the splenic vein is nonvisualized, whereas collaterals between the spleen and the portal vein are visualized.^{22,76} Injection in the superior mesenteric artery shows in the venous phase a normal portal vein with the coronary vein nonvisualized. An improved visualization of the conditions in the area of the splenic vein is obtained by selective injection of contrast medium in the splenic artery.¹⁸ In spite of this, the contrast in the portal vessels is not so dense as in the case of direct portographies: splenoportography and percutaneous transhepatic portography, which also improve the demonstration of the collaterals.⁸⁵ Splenoportography provides better visualization of the splenic vein than does percutaneous transhepatic portography, and therefore some surgeons prefer splenoportography as the first method of examination when splenic vein obstruction is suspected.¹⁷ Another advantage of this examination is the ability to measure the splenic pulp pressure. Percutaneous transhepatic portography^{34,86} and ultrasound scanning^{21,87} have so far been used to demonstrate only a few cases of splenic vein thrombosis.

A characteristic operative finding is dilated, tortuous vessels around the spleen and stomach; the gastroepiploic vein, especially, is marked. The spleen is often enlarged, the liver is normal, and there are no dilated vessels in the right side of the abdomen.^{10,12} Finally, it may be possible to demonstrate the fundamental cause of the splenic vein obstruction. The diagnosis can be confirmed by perioperative splenoportography and pressure measurement, if portography has not been performed before operation.⁸²

Treatment and Prognosis

Segmental PH is treated by splenectomy. Thus, the flow to the varices and the other collaterals is minimized, and the pressure in the collaterals is reduced. To reduce the perioperative loss of blood, a ligature of the splenic artery is recommended before mobilizing the spleen with the great number of collaterals in the ligaments.^{12,33} During the operation, further intervention can be made because of the fundamental disease. In the case of a pancreatic pseudocyst, some surgeons^{12,33} prefer cystojejunostomy to cystogastrostomy in order to reduce the risk of bleeding from the gastric mucosa of the stomy.

In two patients, percutaneous embolization of the splenic artery was performed. One patient was observed for 2 years without bleeding.³⁴ The other developed a large abscess of the spleen.²⁵

The question of prophylactic splenectomy, *i.e.*, splenectomy because of segmental PH in the absence of gastrointestinal bleeding, is not sufficiently clarified.^{12,46,65} In our review, we found only six patients in whom prophylactic splenectomy was not performed, and the course of these patients does not enable us to draw any reliable conclusions. One argument in favor of not performing splenectomy is a few instances of regression of the splenic vein obstruction in connection with improvement of the fundamental disease.^{31,50,81}

Conclusion

Isolated splenic vein obstruction is a rare but important condition that gives rise to the formation of gastrointestinal varices, which, in their turn, imply a risk of serious upper gastrointestinal bleeding. The condition should be considered, especially if isolated gastric varices are present in a patient who shows signs of a pancreatic disease and no signs of a liver disease. The diagnosis can be confirmed by arteriography, probably accompanied by splenoportography.

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